Deep UV Raman/Fluorescence (DUV-RF) Stand-Off Sensor for Lunar Science, Phase II

Completed Technology Project (2009 - 2012)

Project Introduction

This Phase II proposal is to develop a miniature, low power consumption, fused deep UV Raman and native fluorescence (DUV-RF) 1 meter stand-off sensor. The proposed instrument has an enhanced ability to measure the spatial distribution of chemical species containing C/N/H/O/S/Cl, and water, ice, and hydrated-minerals on a 1-5 mm spatial scale enabled by a novel wide-aperture, high-sensitivity ultraminiature UV Raman spectrometer. Raman spectroscopy is a non-contact, non-destructive, method of identifying unknown materials without sample acquisition or processing; ideal for in-situ rovers. However traditional Raman instruments are plagued with fluorescence backgrounds, require sample altering, high-powered lasers, and require the use fiber optics; an instrument design with operational constraints and high power requirements. Our innovative instrument design incorporates our deep UV lasers for fiberless resonance Raman spectroscopy in a fluorescence free zone where resonance effects lead to enhancements by > 2-3orders of magnitude over 532 and 785 nm systems and can be coupled to native fluorescence for ppt detection of aromatic organics compounds. The New Frontiers has placed a South pole-Aitken Basin sample return as a future mission scenario. The enhanced detection capabilities of DUV-RF can be used to provide an understanding of organics and water distribution in the lunar regolith.

Anticipated Benefits

Potential NASA Commercial Applications: The technology being addressed by this proposal is immediately useful for Department of Defense (DOD) and Homeland Security (HS) applications as well as non-government commercial and industrial applications. DOD and HS applications include in situ biological and chemical warfare sensors to detect trace levels of biological, nerve, and blister agents as well as low-volatility toxic industrial chemicals (TICs). The ability of the sensor to measure hazardous materials at meters of working distance vastly improves their use by first responders.

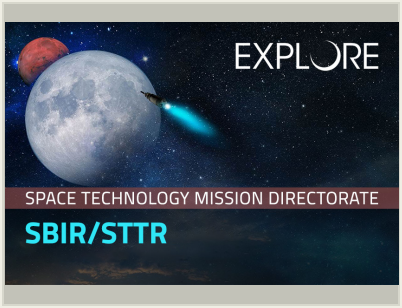

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Table of Contents

Project Introduction 1
Anticipated Benefits 1
Primary U.S. Work Locations and Key Partners 2
Project Transitions 2
Organizational Responsibility 2
Project Management 2
Technology Maturity (TRL) 2
Technology Areas 3

Small Business Innovation Research/Small Business Tech Transfer

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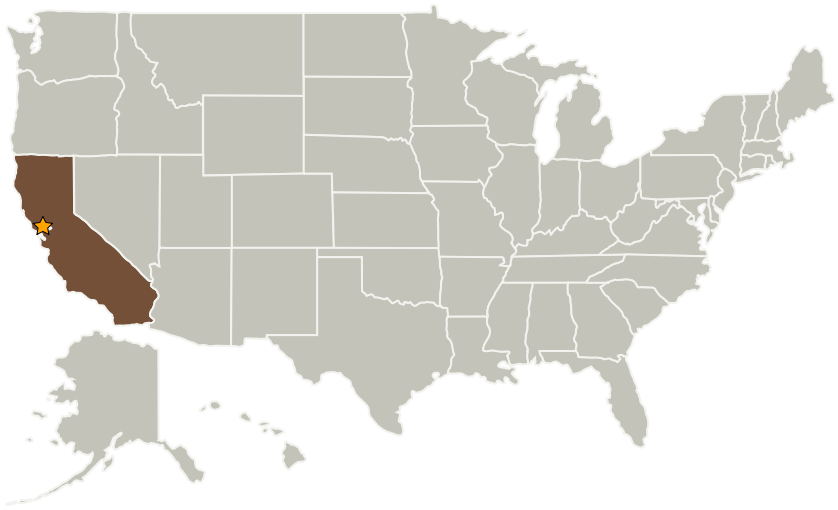
Completed Technology Project (2009 - 2012)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Photon Systems, Inc.	Supporting Organization	Industry	Covina, California

Primary U.S. Work Locations
California

Project Transitions

December 2009: Project Start

March 2012: Closed out

Closeout Summary: Deep UV Raman/Fluorescence (DUV-RF) Stand-Off Sensor for Lunar Science, Phase II Project Image

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

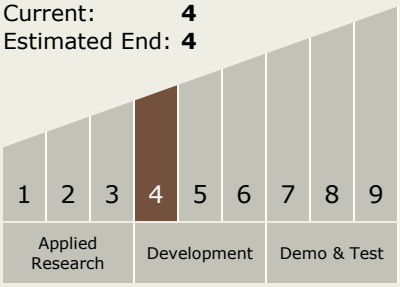
Carlos Torrez

Principal Investigator:

William F Hug

Technology Maturity (TRL)

Start: **4**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.2 Atomic and Molecular Species Assessment